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THE MAC FLYER - For Greater Safety in MAC Air Operations

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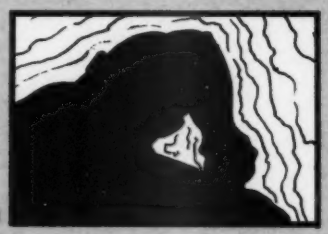

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MAC'S CHIEF OF STAFF . . . ON SAFETY

Maj. Gen. William E. Overacker

SAFETY–the very word brings thoughts of programs, lectures, articles, and hopefully, magazines. We see slogans everywhere: Fly Safe, Drive Safe, We Have Had □ Days Since The Last Accident, and so on. Everywhere we turn, someone is asking us to do something safely. What does it really mean? Why the great emphasis? Can we really get our job done and still be safe? Do we need it at all? Does it do any good?

The purpose of safety is twofold. First, it helps us conserve life and property. Every year, thousands are killed by *preventable* unsafe acts. Hardly a day passes when I do not read a message announcing a serious injury or death to an Air Force member caused by an unsafe act. Most were preventable—*all* were tragic.

But as notable as this objective is, there is still another: preserve our combat capability. After all, this is our profession—maintaining peace through our ability to prosecute war, if called upon to do so. But to be strong—to be able to fight and win when necessary—we need all of our people and all of our equipment. Safety helps us keep what we have in tiptop condition.

To be effective, safety cannot be just a program. **SAFETY MUST BE A STATE OF MIND.** To be effective, it must be an integral part of our every act. Nothing we do should be separated from a consideration of safety. Over the years, I have occasionally heard some argue that safety really stands in the way of mission accomplishment—that we cannot afford to overemphasize it. WRONG! Safety is designed to protect resources (people, airplanes, equipment, money), and, without these resources, our job can never get done.

As a safety-conscious crewmember, your job is to practice risk management. In my view, safety is just another term for risk management. The question you must always ask is: "Is the outcome of the event I am about to undertake worth the risk of doing it?" The answer, even for the same event, may differ depending on the situation. In our peacetime mission, almost no event is worth added risk. The same event in combat or in lifesaving situations might elicit an entirely different answer.

We must make safety an integral part of our decision-making process. We must develop a conservative approach to our job. Nothing in our peacetime mission requires us to compromise safety. Safety must be first. If and when the priority changes, your commander will tell you!

FLY SAFE!

William E. Overacker

The Big Mission

By Capt. John H. Fitzgerald
1550 CCTW/SE
Kirtland AFB, New Mexico

It's an unwritten law that these things have to happen at night! I don't mean late in the evening, I mean late at night. Just like doctors getting calls about babies, rescue pilots have gotten used to getting 0330 calls about the big mission. And so . . . that's how this story begins, at 0330, when with an unconscious reflex, Mark, our hero, answers the phone.

1987 MAC Flight Safety Writing Contest Honorable Mention

He'd been flying the big Jolly Greens for five years now and knew he could fly it as well as anybody. Mark upgraded to aircraft commander in record time, and everyone could tell he loved his work. That's one reason the late phone call not only didn't bother him, but had him wide awake in seconds.

The flight suit went on with practiced ease and he'd driven halfway to work before his boots were fully laced up. The SP at the gate waved him on as if he knew how urgent the mission was.

By the time Mark walked into operations, his heart was pounding and he could feel the excitement everywhere! Just behind Mark walked the flight engineer, a crusty old master sergeant from way back, and the brand spankin' new second lieutenant copilot. Tim Clyde, the flight engineer, looked as if he'd just finished a battle in the Civil War. (Mark even made a mental note to ask Sergeant Clyde about some of his war stories. He was sure to have some good ones.)

The duty officer started to talk about the mission. A ship was sinking almost a hundred miles off the coast with four souls on board and no chance of reaching land. Mark had to silently laugh when Tim shook the copilot back into a conscious state. "Come on, this ain't no college course. We're about to make you into a genuine American hero."

"Go check out the aircraft," said Mark as soon as the briefing was over. "We'll follow you with all the medical gear," he continued. "Okay, let's go . . . we've got lives to save and time's a-wasting."

Running with 50 pounds of gear was not one of the things Mark had considered when he came into the Air Force, but the adrenalin was pumping and the urgency of the mission made it easy. The gear was tied down in the aircraft and Mark was getting nervous about the delay in getting airborne. It hadn't been more than a dozen minutes since they'd arrived at the squadron, but to Mark it semed like hours.

"How're you doing up there, Sergeant,?" came out of Mark's mouth before he'd even thought to say it.

"It's going to be a little while sir. I've already found the engine oil over-serviced, and I don't want to miss anything else that might be wrong," said Sergeant Clyde.

We've got lives to save, and time's a-wastin'

"Come on, let's get going. You heard the ops officer. Those people don't have much time left," replied Mark, and then instantly regretted it. Mark knew Tim was a professional and if he felt uncomfortable with the aircraft, there probably was a good reason. After all, hadn't Tim been flying these helicopters since old Igor Sikorsky had invented them?

Mark could sense the need to rush, the need to get out to the ship and save lives, but the rest only felt the little pushes to get their jobs done sooner. That's how the checklist went also—Mark was always one or two steps ahead of what was supposed to be checked. Tim did his best to keep things under control and not allow any items to be missed . . . but . . . Mark was in command, and he let everyone know he was in a hurry.

That's how it happened. Nothing noticeable right away. A small filler cap on the intermediate gearbox was left unscrewed. The small gearbox turning the tail rotor drive shaft hardly ever gave anyone trouble. It only needed a couple of quarts of oil to work all day.

"Gear up, After Takeoff Check," commanded Mark, "and let's get the aircraft cleaned up as soon as we can."

Tim was glad to get a chance to tie down everything in the back while the copilot finished the checklist.

Radio calls to command post with all the latest information on everything from the ship's exact location to the survivors' condition were passed. As the next 30 minutes went by, everything was updated and double-checked. Those items that had been rushed on the ground were now meticulously reviewed.

"Roger, we're about 60 miles out now and estimate the ship in another 15 to 20 minutes," radioed the copilot.

"Let us know the minute you have the ship in sight," was the command post's reply.

That's when Sergeant Clyde saw smoke building up in the cargo compartment. Not a lot of smoke—just a light blue haze—about the same way a cigarette smokes up a small room.

"Sir, I think we might have a problem back here," said Tim.

The filler cap had finally vibrated off. Air was flowing over the filler neck causing oil to be syphoned into the aircraft slip stream.

"What kind of a problem do we have?" asked Mark.

Tim replied, "I don't know yet, sir. Maybe you'd better take a good look at the gauges to see if there's anything wrong while I go and check in the back."

Tim couldn't see the area around the gear box, but if he could have he would have seen the bright silver paint on the outside of the gear box turning a deep brown. The gear box had long since started to overheat.

"Sir, I've got smoke in the cargo area. The best I can determine, it's coming from the tail pylon," commented Tim.

"Is it something serious? We can't smell anything burning up here," asked Mark. He was still hoping to make the rescue, but was beginning to feel uncomfortable about it.

"We need to turn around and get back to shore. This doesn't look good at all," Tim said with some insistence.

"They're going to love this back at the squadron," said the copilot. "We're almost at the ship now and we have to turn around without making the pickup."

This made Mark feel even worse. He knew no one would leave him alone for the next week. A little kidding may be good for the soul, but this would be terrible; lives were at stake. That's one reason he hesitated another minute or two before turning the helicopter around and headed for the nearest shore.

"Understand you're declaring an emergency?" was all that came from the command post.

"Yes, we're inbound with some type of smoke building up in the cabin area," radioed Mark.

Tim had long since guessed the gear box was causing the problem. He was extremely grateful Mark had turned the aircraft around without too much argument. They'd already gone through the smoke and fume elimination checklist, but the smoke came right back and showed every sign of staying for the duration.

"Here it is in the Dash One, sir," said Tim.

Tim read the warning out loud. They would have to ditch if anything else associated with the gear box area went wrong. Suddenly, Mark went from worrying about the aborted rescue to hoping they'd be able to get back to shore without another problem. Mark's hopes were shattered as the helicopter started to shake. It started as a small vibration, but everyone could feel it growing by the second. The gauges got fuzzy, it became hard to talk, and Mark was no longer flying the aircraft as much as he was just herding it in the right direction.

Saving time won't always save lives!

"AUTOROTATION," yelled everyone at the same time.

From 2,000 ft it seemed to take forever to get to the water. That is, until they passed 300 ft—then it all happened at once. The dark water took shape as swells and waves became visible. The wind was whipping up some good waves, but it was the swells that got everyone's attention. From altitude they'd appeared to be 5 to 10 ft high, but nothing like the 20-foot swells they could see now.

Touchdown was softer than normal. Mark had set the helo down on a swell just as it reached its peak. Then the roller coaster ride began. The helicopter went up and down on the swells five times before turning upside down. It rolled over with no real warning and faster than anyone could have anticipated. Tim pushed the life raft out the cargo door and held on to let it pull him to the surface. Minutes passed before he could get his breath and climb into the raft.

The lights of the overturned helicopter were visible and illuminated the crewmembers who all managed to make it out safely. They swam to the raft with Tim's encouragement. Once they were all inside, no one said a word. It was almost 15 minutes before they finally started to talk and the survival radio was put to work.

The crew spent just over an hour in the raft before another rescue helicopter arrived on scene. Tim watched it lower its rescue hoist to pick him up while wondering—*how much of a preflight had they really done to be able to get here so fast?* ★

Captain Fitzgerald is a graduate of Miami University with a degree in accounting and a minor in aeronautical mathematics. Commissioned through ROTC in May 1978, he has flown helicopters since. He's flown the HH-3E, Jolly Greens, at Clark AB, Philippines; Shaw AFB, South Carolina; Osan AB, Korea; and is presently an instructor and the wing's Chief of Safety at Kirtland AFB, New Mexico.

LOX

IT ISN'T JUST FOR BAGELS!

By Maj. Stephens F. McCauley
Associate Editor

Crewmembers frequently describe a contaminated oxygen system as having a rather distinctive odor: a smell like rotten eggs. (Remember that detail for the pop quiz which follows.)

Oxygen equipment on our modern transport aircraft often gets rather cursory attention. Quite naturally so. Extended flight in the comfort of a pressurized cabin calls for infrequent use of crew or passenger oxygen systems. Thus, aircrews merely check oxygen systems for proper operation and count on its "ready" or "immediate" availability should circumstances dictate. We've come to lump it into the category of "works good, lasts a long time." After all, it's primarily intended for emergency use. Transport aircraft oxygen systems span quite a lot of territory as a technical or safety topic, so detailed discussion demands more attention than possible here. That info is best gleaned from specific aircraft operator's manuals.

So let's focus on that element common to oxygen systems on most modern transport aircraft: liquid oxygen, or "LOX." Everybody has heard LOX requires special care, especially by ground handlers of such very cold stuff. Awareness of its unique properties and characteristics is a fundamental necessity for every well-informed aircrew.

Most crewmembers understand the basics pretty well. You check the LOX quantity guage during mission preflight. If it's too low, you call to have it topped off. When the LOX servicing cart arrives, the support folks clear non-essential personnel to a safe distance, connect the hoses, then recharge your system. Concurrent servicing with any other materials (fuel, water, nitrogen, oil, etc.) isn't permitted. Finally, you preflight the 0_2 system and commence your mission. Should time or availability make LOX servicing impractical, you would check the charts to see if you can perform the mission with what you have on board.

Well, there is certainly more to know about LOX systems, especially concerning safe operating practices. But first, let's review some technical information about LOX hardware. The LOX container on your aircraft is a green globe. Usually located outside the cabin in an unpressurized area, that cylinder is called the LOX converter. It's double-walled for temperature insulation and, much like a thermos bottle, the outer cavity is a factory sealed vacuum chamber.

The inner cavity contains LOX at a temperature of minus 299 degrees Fahrenheit. A cryogenic liquid, its properties are covered by that branch of physics which deals with extremely low temperatures. Temperature within the pressurized cavity is crucial, since LOX will boil at minus 297 degrees Fahrenheit. In its liquid state, LOX is a pale blue, nontoxic, nonviscous, water-like fluid—but 1.14 times heavier than water. When it warms above minus 297 degrees F,

it reverts to its natural gaseous state and expands to approximately 860 times its original volume. Thus, as soon as LOX exits the green converter cylinder, it instantly converts to a gaseous state. Even though LOX "warms" into a gaseous state when it exits the converter, it's still too cold to inhale directly without risking respiratory damage. Thus, the pressurized gas first passes through an oxygen heat exchanger to warm it to breathable temperature before it gets to your regulator.

A commonly misunderstood property of LOX is its flammability. LOX by itself will not burn. However, it will vigorously support combustion in the presence of just about any other material, including aircraft aluminum! The January 1967 tragedy on the first scheduled Apollo mission bore sad testimony to that fact. After a tiny electrical spark ignited the velcro and plastic materials in the oxygen-rich environment, Astronauts Grissom, White, and Chaffee were dead within 15 seconds. It's certainly valid to question the judgment of a person who reportedly took a drag of O_2 on the flight deck and then blew a 6-inch torch through the lighted tip of his cigar. But pity the guy who tried to cool himself with 100 percent oxygen by directing the flow inside his opened flight suit. He burst into flames and was fatally burned when he lit a cigarette.

Because LOX is contained under pressure, it may vent overboard when conditions (temperature or pressure) cause its volume to exceed converter capacity (remembering high school physics, liquids are noncompressible). In fact, that's how the LOX servicer knows when the aircraft converter is full. The higher pressure supply cart cylinder remains connected until the aircraft converter vents LOX overboard—hopefully without permitting spills onto asphalt or the individual. LOX reacts with any petroleum based material, including asphalt. In direct contact with human skin, it will cause "burns" due to instantaneous freezing action.

You've heard oil and water don't mix. Well, oxygen shouldn't be mixed with either oil *or* water. Aviator's breathing oxygen mustn't be confused with industrial or hospital oxygen. These types contain water which could render aircraft oxygen equipment ineffective. At the point where LOX leaves the aircraft converter and warms to a gas, moisture in the system would freeze and plug supply conduits. LOX hardware and all materials with which oxygen might come into contact must also be kept petroleum-free. Lip balm, lip gloss, and other petroleum-based products must be avoided in an oxygen rich environment. The oil and grease hazard is so great, LOX servicers maintain an entirely separate tool set which may be cleaned only with special solvents.

What about the LOX quantity indicating system? How does it work? The guage indicates quantity of liquid in the converter, measured in liters. Electrical probes measure electrical resistance in the converter and display the calibrated value on the 115 volt AC indicator. LOX system preflight begins with checking aircraft forms to note the recorded servicing level. Press the test button to run the needle down to zero indication, and note whether the "LOX LOW" light illuminates at the 10 percent remaining point. Note volume when the guage returns to a final value. If the system hasn't been used for about a 12-hour period, unexplained loss of more than half a liter warrants maintenance attention. Don't be lulled into accepting excessive pressure readings on the oxygen regulator pressure indicator just because "it always reads high." A faulty relief valve on the LOX converter could be responsible for too much pressure to crew station regulators.

Now, for the final test question: What smells like rotten eggs, but isn't? Rotten LOX, of course!

Whether your aircraft system consists of 5, 25, 50, or 75 liters, these simple reminders should rekindle fresh awareness of an old topic. LOX can be your friend—don't let it be your enemy!

References: Accident Prevention Manual for Industrial Operations
Fire Protections Handbook and T.O. 15X-1-1.

(Grateful acknowledgement for technical info from Mr. George Merritt, 375 CAMS.)

His Master's Voice

Every dog has his day.

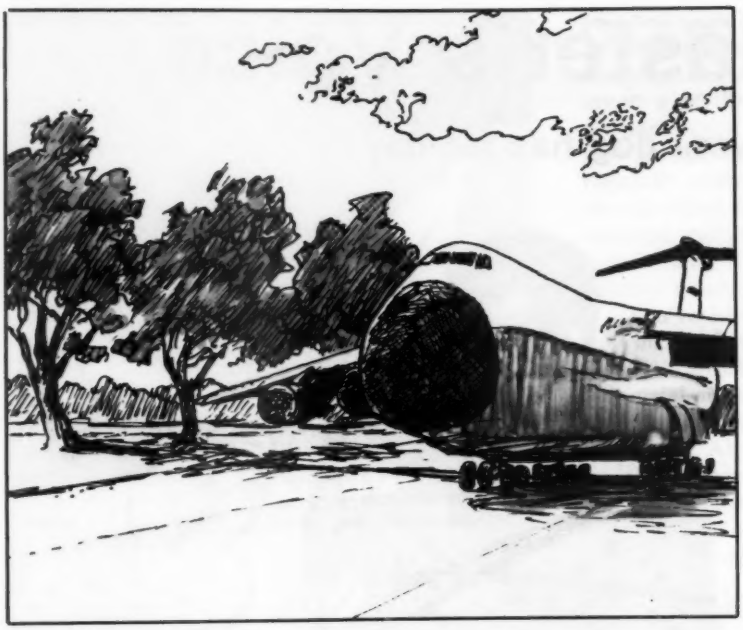
"Come on boy," said Mac MacKenzie to his dog as he opened the passenger door to let him out of the car. "That three-day delay on my trip really put me behind at the office. We'll just go through the mail so we'll be finished in time for the birthday party. I know you don't want to miss that. Not a fun thing to do on a Saturday morning, but sometimes you just don't have much choice.

"You just lie down over there in the corner. Oh brother, look at this pile of messages. What did these guys do while I was gone? Didn't *anybody* do *anything?*

"Well, we'll just start at the top of the pile, right boy?"

Mac's dog just put his head on his paws and looked up as if to say, "Well, hurry up you big jerk; we don't have all day."

"Uh oh, here's a final on a C-5 taxi mishap. Let's see what happened. The airplane was led to the ramp by a 'follow-me' vehicle. There was a tree line about 54 ft from the right edge of the ramp. Hazards were identified using a 1978 survey. Not good. But a C-5 had used the ramp before. Ah, the old 'the other guy made it' trap. They didn't deplane a scanner—not required, but often a good idea. The head marshaller signalled a half right turn into the ramp to bring the airplane as close to the edge as possible to allow room for later arrivals. The head marshaller then signalled a half left turn to position the airplane parallel with the ramp edge. No signals indicating problems or reasons to stop. Here's the rub though; due to the left turn, the right wingtip 'grew'



and went into the trees. The wingtip marshaller saw the wingtip go through the branches but later stated it happened too fast to signal. Gotta anticipate, right boy?" he said to the now sound asleep canine.

"Okay, go ahead and sleep. You need to rest for the party. Anyway, the copilot and another aircraft commander (who were both looking out the right window) didn't signal a stop because they couldn't see the wingtip due to its swept design. Yeah, there's a big chunk out there you can't see. Need to stay aware of that situation and plan accordingly. Nobody told the AC about hitting the branches until shortly before departure the next day. They'd lost the nav light fairing and a static eliminator. Could have been worse, I guess, but that C-5 is a big hummer and you gotta be careful. Flying's the easy part. Moving it around on the ground is the tense part, right?" The dog sneezed and continued sleeping.

"Well, what else do we have here? Oops, a C-141 tail scrape. Let's see, the crew had three long duty days, two of them consecutive. Makes it tough to stay alert, especially when you throw in some night flying. Added to that, they extended their basic crew duty day 2 hours and 10 minutes. Maybe not a good idea when you're tired to begin with. The AC flew a visual approach. Okay, it was daylight, but a precision might have been better due to the fatigue—might have kept things more precise . . . that was a joke," he said, looking at the dog. There was no response.

"On short final, tower told them to land past the arresting cable, about 1,500 ft down the runway. One of those unexpected deviations with little time to react. They can cause trouble. He adjusted his aimpoint, but not power. Of course, this resulted in a higher than normal pitch attitude. They deployed spoilers after their pitch attitude decreased below five degrees. Now, spoilers induce nose pitch-up, and they scraped the tail. Getting the nosegear on the ground before deploying spoilers is important, so the cause was *not* putting it in that stance before deploying spoilers. That's a real fine line when you're at the edge of a limit, it takes only a little nudge to go over that edge. A little distraction, like the call from tower, can be enough to take attention away from the more immediate task. In this case the task was controlling pitch and power—pretty crucial when landing an airplane, don't you agree?" The dog scratched himself in his sleep.

"Now to the C-130s. Here we have a copilot, in the right seat, flying a simulated engine out go-around with number 1 engine simulated shutdown. The copilot advanced power on the other three engines. The engineer made the required '17,000' call as power passed through 17,000 inch-pounds of torque. The copilot claims he heard it but didn't respond. Very methodically conducting go-around procedures, the copilot kept pushing the throttles without looking at the gauges until the instructor pilot grabbed them and pulled them back below the 19,600 inch-pounds limit. The flight engineer simultaneously called 'torque' over the interphone. He reported seeing between 24,000 to 25,000 inch-pounds on all three engines before stabilizing at 21,000 inch-pounds. The overtorque precipitated replacement of the upper and lower engine mount bolts, cones, and forward (or lord) mounts. Instructors really have to watch and anticipate what that other guy *could* do. It's a tough job, but something like that can really torque your jaws . . . that was another joke, by the way." The dog yawned without waking.

"Hmmm, what's this? Boy, these guys had a realistic sim ride. They started smelling smoke, turned off the motion, opened the door to find where the smoke was coming from, and alerted maintenance before bailing out of the

building. Maintenance guys put the fire out before the fire department got there. Too bad it's not that easy when it happens in flight. I can tell you're really fascinated." The dog scratched himself again.

"You like to swim, so you'll like this one. Seems a C-130 dropped some CCT folks, six to be exact, over a water drop zone. The airplane also dropped something called a CRRC or Combat Rubber Raiding Craft. The load swung high behind the chute on the first oscillation, evidently activating the zero-G release mechanism. The load sank in 400 ft of water. They lost one 15-foot Zodiac boat, one motor for said boat, six rucksacks, some miscellaneous gear, and six rubber M-16s. Do rubber M-16s shoot rubber bullets?" The dog, still asleep, rolled over on his back.

"This one looks serious. Seems there's an agreement between Patrick AFB RAPCON and nearby Melbourne tower. Patrick RAPCON can use a good-sized part of the Melbourne Airport Traffic Area, without coordination, for VFR overflight and instrument approach maneuvering to land on Runway 02 at Patrick. Melbourne's standard procedure is to allow departing VFR aircraft to climb through that portion of the ATA used by Patrick RAPCON without any coordination or exchange of traffic information with Patrick. The only advisory a departing Melbourne aircraft receives is to 'contact Patrick Approach Control for traffic advisories.' But, they've now revised that, a little anyway, by including in their ATIS a statement that 'instrument approaches are in progress to Runway 02 at Patrick.' That may help a little, but still leaves a potential hazard. Two aircraft can operate within Melbourne's ATA, without knowledge of each other, talking to two separate agencies, with no traffic information passed between those two agencies. I'll have to jump on this Monday morning, right?" The dog rolled back on his stomach and yawned again.

"Don't get so excited, we won't be much longer.

"Here's one about your favorite, the C-21. The airplane landed and parked in its usual spot at home station. Maintenance chocked the nose wheel instead of the mains. Not a good idea, and not according to the Dash One. The hydraulics were shut off, which of course meant no parking brakes. Can you see where this is leading?" The pooch made no response.

"Of course, about 30 minutes later, contractor folks came and started to refuel the airplane. After transferring a mere 700 pounds of fuel, the airplane jumped the chocks and began an unmanned taxi across the slightly downsloping ramp. The maintenance technician tried valiantly, but alas failed, to place the chock in front of the mains. He then tried to kick the nose wheel to deter it from its path, but again failed. The aircraft finally came to rest after striking the rear window of parked PMV (that means private motor vehicle) with the tip tank's fin. Looks like one final look at their airplane by the crew could have prevented this one. It's those little details that can make a big difference. Little details, big difference, get it?" The dog belched.

"Well now, here's my favorite—NASA's *CALLBACK*. Let's see, here's a good one. The captain was in the cockpit reviewing the flight plan, hoping for a quick turnaround. The copilot returned from his walkaround and told him there'd be a delay. Cargo folks spotted a snake with red bands hiding among bags they were about to unload from the aft cargo bay. He informed ground control and they promptly accused him of flying too low over the desert. The fire department and police were on the scene in a jiffy. While the captain was making his way to the back of the airplane, the agent made an announcement in baggage claim for anyone traveling with a snake to pick up the red paging phone and claim same! The police actually captured three snakes, all non-venomous King Snakes. Several bags taken out were suspect—partly open. No one came forth in baggage claim, so when the bags came off the carousel, the police were there to see who picked them up. One bag was picked up by a guy who seemed in a hurry. When questioned by police, he admitted they were his snakes. Upon further questioning and a check with the police computer, they found there were several warrants out for this snake charmer. Off he went to jail. Wondering what happened to the snakes? Well, they were released in the desert south of the airport, close enough to watch airplanes and reminisce about their aeronautical adventures. I wonder if there were only *three* snakes.

"That's about it, big guy. Let's go," Mac said rising and heading for the door. The dog didn't stir. "Come on, boy, let's go."

"All right. PARTY TIME, SPUD." The dog rose and bolted for the door as if shot from a cannon. Mac followed, shaking his head, locking the office door behind him. ✈

Do rubber M-16s shoot rubber bullets?

The Training Mission

When you least expect it, expect it!

By Col. Gary B. Koch
Deputy Director of Safety

"Today we'll be doing initial upgrade training on Lt. Smythe and an instructor upgrade sortie on Maj. Black. Lieutenant Smythe is scheduled for T-6, a transition mission at the auxiliary field, and Major Black for an instrument instructional ride. Lieutenant Smythe will fly first."

I figured today's training flight would be rather easy. Lieutenant Smythe was doing fine in the H-1 program, and Major Black was an experienced helo pilot, current and qualified in the H-1, zooming through the instructor pilot syllabus. A good student combination for my last flight of the week.

Preflight, engine start, and taxi were accomplished without a hitch.

"Save 33, you're cleared for takeoff, aux field departure," radioed the tower.

Off we went. Little did I know this was going to be a most exciting flight.

"Sir, there's something wrong with the tailrotor pedals. The right pedal won't move," said Lieutenant Smythe.

It was a great, sunny, New Mexico Friday afternoon, so I certainly wasn't too keen on hearing those words.

"Are you sure you're not applying equal pressure to the pedals with both feet?" I asked.

"Yes sir," said my novice rotorhead. "The right one just won't move."

At that point I took control of the aircraft and confirmed that, indeed, the right pedal was stuck. *Fixed Pitch Failure!* (A tailrotor problem—the dread of all helicopter pilots.) We continued to climb straight ahead on our departure heading to assure sufficient altitude to accomplish an autorotation in case we should completely lose tailrotor drive. Once passing 300 ft, I called tower to relay our problem and declare an emergency. In the meantime, Major Black got out the Dash One to review procedures for fixed pitch failure.

The procedure seemed simple enough. All we needed to do was walk and chew gum at the same time. (All helicopter pilots can do that, right?) With a plan solidly in mind, we performed a controllability check to make sure coordinated throttle and collective movements affected the aircraft as advertised. After testing control movements and convincing ourselves we could do the procedure, we were ready for the approach. We notified tower of our intentions, and—what was that, tower?—no, we really need to use the runway and not helipad one. After straightening that out, we went for it. Our approach looked great all the way down until we got to the point of actually touching down. I had problems getting the nose straight for landing, plus getting the aircraft to descend that last one or two feet. Every time I rolled the throttle full on, the helo wanted to level off or climb slightly. Kirtland has over 13,000 ft of runway and I used all of it trying to land. As you can guess, I wasn't successful on this try. We felt we did everything by the book, including a shallow, decreasing airspeed approach to approximately 25 knots. But what the book didn't tell us was that the aircraft may be more sensitive to collective and throttle inputs at faster slide-on landing speeds when positive directional control cannot be maintained.

So, here we were on the go from our first approach, wiser and ready to try again. Major Black requested that on our next try, when we got close to the ground and were going real slow, he and Lieutenant Smythe be allowed to jump out instead of riding in this staggering helo. (Of course, I couldn't approve such a request! They'd damage the runway with their heads when they hit the ground.)

But, what's this? Lo and behold, my feet were tingling from the onset of a severe vibration through the tailrotor pedals. My students sensed my anguish when they heard me say, "Ooooh, #°/:;%!" At that point we knew we had real problems and had to get on the ground quick or face the ultimate dread—autorotating with complete tailrotor loss.

We set up for our second try with a sense of urgency. By this time quite a crowd had assembled along the taxiway to watch. Also, commercial airline traffic was backed up waiting for me to get this thing on the ground.

On this approach, we decided to fly a little slower during the final landing phase, approximately 10 to 15 knots, hoping this would help with the control sensitivity problem. As we got nearer the ground I slowly lowered collective while simultaneously rolling on full throttle. The aircraft straightened out and continued to settle to the runway just as we'd planned. Slowing to a stop was even better than a carnival ride. When we finally did stop we were facing 120 degrees left of our original landing heading. Our plan had worked.

It was finally over—I could stop shaking and relax. We'd put the helo down with no damage. I now had time to reflect on the previous 45 minutes. Major Black and I determined Dash One procedures weren't entirely correct, at least from our perspective after having just flown the maneuver. Additionally, during our rehash, we realized how our crew interaction affected the final outcome. Both Major Black and Lieutenant Smythe offered suggestions that helped in my analysis of tailrotor problems and associated helicopter flight characteristics. Both brought up points I could have overlooked had I not been willing to listen. After all, I was in charge. I'd forgotten more than they knew. What did these students know? All kidding aside, I was thankful for their help. I can imagine what it would have been like had I been alone. At least with their inputs, I felt I had all the information available to make smart and safe decisions.

It just goes to show you, you don't have to be the recognized expert to provide a piece of the puzzle—perhaps the most important piece. ✈

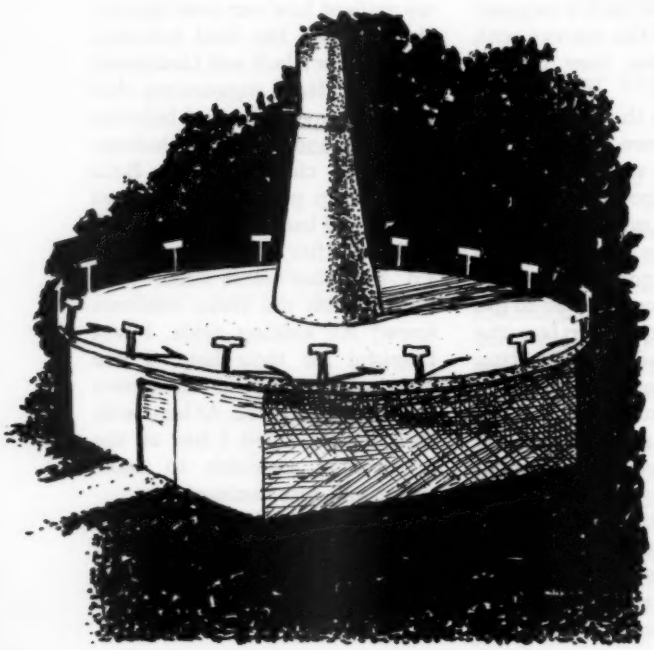
At that point we knew we had real problems and had to get on the ground quick or face the ultimate dread—autorotating with complete tailrotor loss.

TMF Instrument Quiz

Know how to plan.

We're all very much aware that flying is far more involved than stick and rudder inputs. While each of us has enjoyed flying with a "stick man," we're trained to operate flight controls in a manner which puts the air machine pretty much where we want it. Therein lies the challenge—"where we want it." Where do we get that all important piece of the puzzle? Experience is one of the best teachers; we've all chuckled at the NAF Airfield Summary edict that goes something like: "You can't go there unless you've been there before!" But what about that? In fact, if we think about it, there's wisdom in that directive and it really doesn't tie our hands as much as we think. Furthermore, the restriction applies to very few foreign airfields. Fact is, many of us quite frequently land at airfields where we've never been before.

Whenever this happens, how is it you know where you want the airplane? Three reasons: planning, planning, and planning. Planning is a unique task. It can be done without conscious thought. Take, for example, turning into parking; were you given the task of stopping and explaining your intentions, you would be able to graphically explain your plan. Where exactly you intend to stop, lead the turn, add asymmetrical power (including what side), and so forth. You could probably conduct a 30-minute lecture on this simple maneuver.



Yet, you did it all in your mind in less than a second! How? Experience. After a couple of years of watching your machine in operation from the right seat, you get a pretty good feel for what it ought and ought not be able to do. Those years of watching also provided the opportunity to use flight controls and practice putting those plans into action. As a result of your experience, coupled with your demonstrated ability to combine judgment and previous experience to handle situations you haven't seen before, you upgrade.

But it's not over yet, at least it better not be! Gaining experience is an ongoing task interrupted only by death. Therefore, preventing permanent cessation of experience gathering also becomes a significant, worthwhile plan. There's that word again—**PLAN**—and that's the general theme of this month's instrument quiz. Planning can be everything from meticulous chart study to what could almost be called casual thought. All planning types included, a good one can make the difference between success and failure. Naturally, plan execution is also a key factor; but, we'll presume ability in that regard. Suffice to say, a good plan will pull you through—*most* of the time.

The following quiz was extracted from one of our favorites, AFM 51-37, *Instrument Flying*. Most questions deal with flight planning phases although they ask for specific technical information. Knowing the correct answer for most will be simple; the key is knowing when to ask yourself the same question while planning.

1. Pilots flying aircraft equipped with Radio Magnetic Indicators may use them to back up an ILS approach.
   a. True.
   b. False.

2. VORs are subject to line of sight restriction.
   a. True.
   b. False.

3. The localizer signal is usable and accurate to a range of 18 nm from the antenna unless otherwise depicted on the IAP.
   a. True.
   b. False.

4. The glide slope signal is usable and accurate to a distance of 10 nm unless otherwise depicted on the IAP.
   a. True.
   b. False.

5. The ILS glide slope is sited to provide 50 ft (+10/-3) runway threshold crossing height. Individual approach plates depict actual TCH.
   a. True.
   b. False.

6. Notices containing information on establishment, condition, or change in an aeronautical facility, service, or procedure that may be a flight hazard are called Aeronautical Information Bulletins (AIB).
   a. True.
   b. False.

7. Class I NOTAMs are time-sensitive and require distribution by electronic means.
   a. True.
   b. False.

8. The Federal Aviation Administration classifies NOTAMS as "D" or "L" series. Only the "L" series meet basic military NOTAM requirements.
   a. True.
   b. False.

9. When developing Standard Instrument Departures (SID) at U.S. airports, civil authorities assume aircraft will cross the departure end of the runway at least 35 ft AGL.
   a. True.
   b. False.

10. Minimum safe and minimum sector altitudes provide a 1,000-ft obstacle clearance within 25 nm of the facility upon which the instrument approach procedure is based.
   a. True.
   b. False.

11. The Visual Descent Point (VDP) is a point on the final approach course of a precision approach procedure from which a normal descent (approx 3 degrees) from the DH to the runway touchdown point may be commenced, provided you've established visual reference with the runway environment.
   a. True.
   b. False.

12. Pilots will read back all ATC clearances.
   a. True.
   b. False.

ANSWERS

1. b. AFM 51-37, pg 42, para 4-2a. The bearing pointers do not function in relation to the ILS signals.

2. a. AFM 51-37, pg 52, para 5-2a.

3. a. AFM 51-37, pg 56, para 5-6b. The distance is measured from the localizer antenna. This is important, since the optimum location is 1,000 ft from the departure end of the approach runway, and on centerline.

4. a. AFM 51-37, pg 55, para 5-6b.

5. a. AFM 51-37, pg 56, fig 5-4.

6. b. AFM 51-37, pg 81, para 7-2. This is the definition of a Notice to Airmen, better known as a NOTAM.

7. a. AFM 51-37, pg 81, para 7-3.

8. b. AFM 51-37, pg 81, para 7-3. "D" series, Class I NOTAMs get wide distribution and meet DOD requirements. "L" series apply to a Flight Service Station's flight plan area and do not prevent operations in or out of an airport. Aircrews flying into civil fields not covered by the Military NOTAM System should contact any FSS for "D" series, and the serving FSS for "L" series NOTAMS.

9. a. AFM 51-37, pg 84, para 7-4d. Air Force crews must plan on crossing the departure end at least 35 ft and climb at a rate of at least 200 ft per nm (unless higher is required). When executing a departure procedure or SID, aircrews must climb on runway heading until reaching at least 400 ft above airport elevation, unless otherwise instructed.

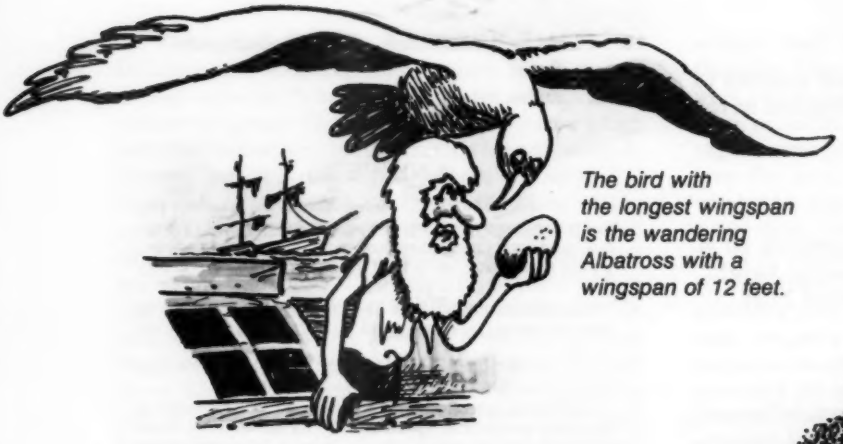
10. a. AFM 51-37, pg 86, para 7-6b(1)(f).

11. b. AFM 51-37, pg 87, para 7-6b(6). VDPs are not used on precision approaches, only nonprecision straight-ins.

12. b. AFM 51-37, pg 90, para 8-2b. There is no USAF requirement for an ATC clearance readback; however, you should read back any portion, or the entire clearance, if you feel the need for confirmation.

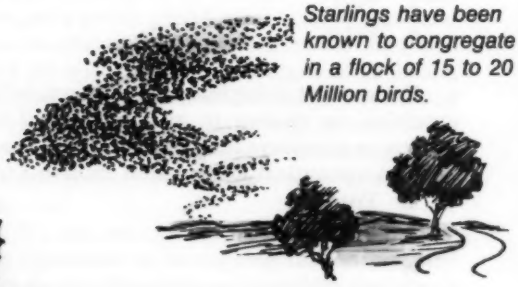
SEND US YOUR FAVORITE QUESTIONS! If you have a favorite GENERAL KNOWLEDGE topic and can write a minimum of 10 questions, send them to us. Please include the answers and references!!!!

FEATHERY FACTS FOR FLYERS

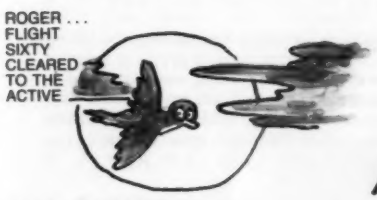


The bird with the longest wingspan is the wandering Albatross with a wingspan of 12 feet.

The heaviest birds that fly weigh in excess of 20 pounds and include various species of cranes, swans and condors.

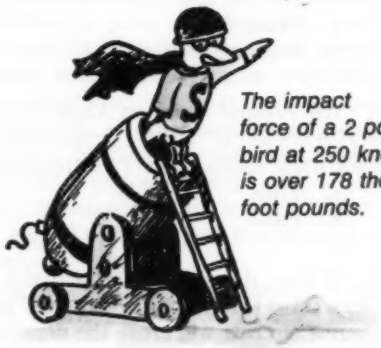


Starlings have been known to congregate in a flock of 15 to 20 Million birds.



Most small birds migrate at night.

The longest migration route for any bird is that of the arctic tern. (12,000 miles . . . arctic to antarctic.)

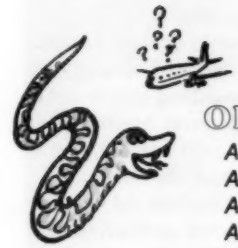


The impact force of a 2 pound bird at 250 knots is over 178 thousand foot pounds.

The first recorded birdstrike accident occurred in 1910. A seagull got caught in the aircraft control cables. In the resulting crash the pilot was killed.

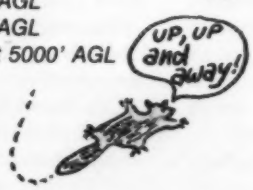
½ to 1 billion birds migrate through CONUS continental U.S.A. each year.

Have you ever wondered what is going through a bird's mind when it finds itself eyeball to eyeball with an object many times larger, thousands of times heavier and travelling, oh ... 20 times as fast? We can't really answer that because we haven't yet learned how to plumb a bird's mind. But we do know something about those feathery creatures with which we have to share the sky, and with which we occasionally have traumatic and even fatal (for both parties) encounters. Herewith, then, are a few things you ought to know about birds, if you are going to share their domain.



ODD STRIKES

A Snake at 3000' AGL
A Chicken at 800' AGL
A Mouse at 8000' AGL
A Flying Squirrel at 5000' AGL



In 1983 there were 2300 reported birdstrikes.

The largest known flying creature is the reptile Pteranodoningens with a wingspan of over 27 feet. Fortunately it is extinct and pilots need never worry about meeting one in flight.

The highest recorded birdstrike occurred at 37,000 feet.

Several Air Force bases are built in the centre of bird breeding or nesting or on major grounds or on major migratory routes.

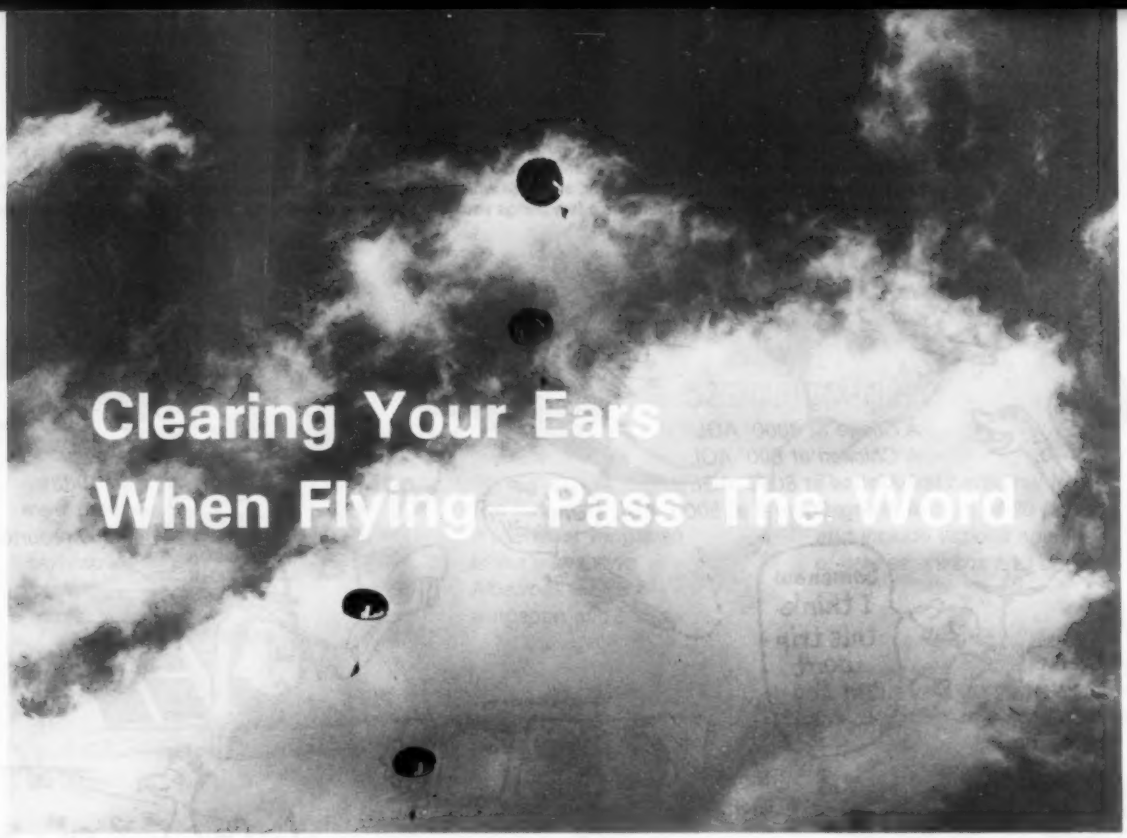
Since 1980 EIGHT aircraft have been destroyed by birdstrikes.

Birdstrike rates per landing/sortie/hour have all at least doubled since 1969.

The smallest bird in the world is the Bee Humming bird. It weighs 1/10th of an ounce.

We now average over 2000 birdstrikes a year.

COURTESY: *FLYING SAFETY*



Clearing Your Ears When Flying—Pass The Word

By MSgt. Christopher E. Caffall
HQ MAC/IGIOA, Scott AFB, Illinois

I was just waking up on a civilian flight bound for Florida. We were descending and I could feel the pressure increasing in my eardrums. As I cleared my ears and looked up, I saw a seven-year-old boy sitting with his parents. As my eyes focused, I noticed tears in his eyes and a look of discomfort on his face as his parents tried to help him clear his ears.

My mind flashed back to a training parachute jump I participated in over eight years ago. That jump comes back to me every time I see someone having problems clearing their ears. I remember hearing the blare of the C-130 engines and feeling the weight of the parachute and equipment strapped to my body and looking at the other 11 jumpers through my goggles past the oxygen mask and helmet. Each jumper responded to the jumpmaster with thumbs-up indicating they'd received the six-minute warning. My altimeter read 18,000 ft. I mentally rehearsed my jump procedures—exit position, free-fall maneuvers, pulling the rip cord, canopy control, target accuracy, derigging, and emergency procedures.

My biggest concern was clearing my ears—I'm one of those unfortunate people who, while free-falling and scuba diving, needs physical Valsalva. You know the procedure—close your mouth, pinch your nose, and try to breathe out so your ears will clear. Well, trying to do that during free-fall or scuba diving takes a conscious effort. Some people are more fortunate, they can clear their ears simply by yawning, moving their jaw, or chewing gum. Even those folks, though, can have problems when they have a cold or sinus blockage.

The jumpmaster gave the "two-minute warning" and we all responded again with thumbs-up. Standing up, we turned on our bailout bottles,disconnected our oxygen hoses from the aircraft oxygen system, checked each other's rip cord pins, ensured our parachute timers were on, and moved to the back of the aircraft to wait for the next command. The noise of the C-130 engines increased as we moved toward the open ramp. The jumpmaster, hanging his head over the side of the ramp, looked up and gave us the one-minute warning. Our eyes were glued on the jumpmaster as he gave us the "stand-by" and finally the "go" signals.

All 12 of us jumped out of the aircraft at 18,000 ft as if we were diving into a swimming pool. Once in free-fall, several jumpers flew in two or three-man formations. Being at the back of the pack when I jumped, most of the jumpers were well below me. I picked out the lowest jumper, threw my arms back to my side and straightened my legs to fly down to him. As I came close, I flared my body by putting my arms in front of me and bending my legs back to the stable position. Once even with him, I cupped my hands to catch air so I could move closer. As I moved toward him, I realized it was Jim, a novice "High Altitude Low Opening" jumper. Jim's eyes revealed his enthusiasm for flying in close formation. I backed off so he could try a couple of approaches. He did pretty well. Time to pull the rip cord was rapidly approaching and, as he had his hands on it, I rolled away from him so his parachute could deploy safely. I came out of the roll, returned to stable position, and pulled my own rip cord. My parachute had started to inflate when I saw another jumper fall below me. My chute jerked open as I watched that jumper fall toward earth. Just as he was almost out of sight, his chute deployed. I figured he must have experienced a malfunction, but who was it? It couldn't be Jim because I saw him go for his rip cord. But then again, I hadn't actually seen him pull it or seen his chute deploy. No, it couldn't be him. I was with him just a few seconds ago. Oh, well, I figured I'd find out what happened once on the ground. As I was getting closer to the target, I noticed the low parachutist was flying away from the target and wasn't turning toward it. I couldn't believe anyone could be that bad.

Once I landed, I asked the ground crew who the jumper was. It was Jim. It turned out he lost consciousness during free-fall and the automatic timer deployed his main parachute. The parachute just flew along with the wind until it landed with Jim still unconscious.

It turned out that Jim failed to clear his ears and lost consciousness when his eardrum ruptured.

After talking with Jim, I discovered it had been a while since he'd jumped from above 10,000 feet. No one had reminded him of the need to clear his ears on the way down. It's not part of the standard jumpmaster or aircrew brief. Somehow, the procedure is taken for granted. When I returned to the parachute area, we learned that two other jumpers had experienced the problem on a previous jump, though without losing consciousness. All I could think of was the pain they must've experienced and the expressions on their faces.

I looked up again and saw the same painful expression on the little boy's face. Tears were running down his cheeks and, with hands covering his ears, he was begging his parents to help. I could see, by the expression on his face, the pain increasing as the aircraft descended. People around him were as helpless as his parents in trying to comfort him. I leaned over and asked if I could help.

After a hopeful nod from both of them, I told the boy to close his mouth, pinch his nose, and try to blow out through his nose. It took a few tries to make him understand. He finally tried, felt the pressure release, waited a second to make sure the pain was gone, then turned to his parents with a smile. I reminded him to keep doing the same thing every time his ears started to hurt. The whole family was happy and I think they'll explain the procedure to friends and others experiencing ear problems while flying.

This wasn't the first time I'd seen people on civilian and military flights experiencing ear problems. Not everyone receives physiological training or is lucky enough to have learned the procedures. Most military and civilian passengers aren't briefed on the effect of pressure differential on eardrums or how to Valsalva. It's a simple procedure—let's remind our novice flyers and jumpers, and most of all, let's pass the word to all passengers so they too can enjoy a safe flight.

HOT WEATHER and the HUMAN BODY

Does it have the hots for you?

While some of our bases are already basking in spring-like weather, others are not; it's just a fact of life and location. Eventually, summer weather will be here. But even on the coldest days, we have an edge—we can fly to summer weather. Of course, the reverse is also true. The fact is, our mission takes us over a wide range of speed and altitude which means we're constantly exposed to a wide range of temperatures. Performance characteristics of MAC aircraft can induce gross temperature changes in a single leg, even if point of origin is in a frigid climate.

Our flexibility also means that it's more common for aircrews to operate on short notice from bases with climatic conditions vastly different from their own. Within minutes of taking off from an airfield where temperature may be more than 100 degrees F, an aircraft can be flying at altitudes where outside air temperature is on the order of -55 degrees Fahren-

heit. If the mission calls for low-level flying, aircraft temperature rises above outside temperatures because of kinetic heat generated by air friction over the aircraft's surface.

Aircraft air conditioning systems are designed to control cabin temperature over a fairly wide range. There are occasions, however, when you'd swear that wasn't true. At these times, temperature passes the comfort level and can interfere with crew performance. Extreme temperature effects aren't restricted to dramatic conditions such as heat prostration or stroke—they can also detrimentally affect a crewmember's ability to perform complex tasks (e.g., engine start and taxi). Our internal body temperature is designed to operate within a very narrow range; deviating outside that range can produce severe performance reductions. Furthermore, these errors are characterized by unpredictability. It's difficult to relate this performance loss to a particular temperature, but performance eventually suffers if it varies significantly from the normal comfort zone.

HEAT SOURCES

Apart from heat produced by your body through metabolic functions, there are four main sources of heat significant to aircrews:

- Climatic effects associated with aircraft operations in the tropics and subtropics, basically the "greenhouse effect."
- Heat sources on the flight deck due to avionics components.
- Heat load induced by wearing heavy flight clothing.
- Kinetic heating.

Kinetic heating isn't as much a factor in airlifters as it is in fighters. Temperature rise due to kinetic heating is given by the formula:

$$T = 0.85\ (V/100)^2$$

where T = temperature rise in degrees Celsius, and V = indicated airspeed. For example, an airlifter flying 250 knots results in a temperature increase of just over 5 degrees C (about 9 degrees F).

BODY HEAT PRODUCTION AND TEMPERATURE REGULATION

Humans are homoiothermal. That is, we maintain constant body temperature despite wide environmental temperature variations. Body temperature refers to the body's deep structure temperature and, under normal conditions at rest, is maintained between 97 and 99.5 degrees Fahrenheit. On the other hand, the skin is usually at a lower temperature than deeper structures. The body produces heat by continuously metabolizing food: due to large physical bulk, it's able to withstand minor environmental changes for several hours with minimum body temperature change. As temperature stress increases, however, various physiological processes maintain constant body temperature.

If deep body temperature is to remain constant, heat gained from the body's various metabolic activities and from environmental sources, needs to be balanced exactly by the amount of heat lost to the surroundings.

Regulation of body temperature and overall coordination of needed responses is ultimately controlled by the thermo-regulatory center in the brain. Basically, this activity coordinates either heat conservation or heat dissipation. Temperature regulation is a reflex action responding to skin receptors and blood temperature. This brain function directs appropriate responses, such as sweating and alteration of blood flow through blood vessels in the skin. In warm conditions, surface blood vessels open to increase skin heat loss. Sweating is another major response to environmental temperature increases. Actually, a certain amount of water loss, known as insensible perspiration, takes place continuously from the body surface. As temperature rises however, sweating occurs, causing body cooling by evaporation. This is a very important temperature-regulating mechanism and is the body's main defense against heat stress.

EFFECTS OF HEAT

Disorders brought about by heat effects on the body result from both function and failure of the thermo-regulatory system. Heat stress effects fall under two main headings: thermo-regulation disorders and failure.

Thermo-Regulation Disorders

Thermo-regulation disorders fall into three categories:

Heat syncope is a sensation of giddiness or fatigue, resulting from loss of surface blood vessel elasticity, without any obvious loss of water or salt. The patient recovers quickly when lying flat and being reassured. It can best be prevented by limiting workload upon first entering a hot climate.

Heat exhaustion due to water depletion is due to failure to replace water loss through prolonged sweating. It causes thirst, fatigue, dizziness, and scanty urine output. Prevention is relatively

easy: drink plenty of water. Note also, in desert conditions this may amount to 12 pints per day.

Heat exhaustion due to salt depletion is due to inadequate replacement of salt lost through sweating and causes fatigue, nausea, dizziness, and cramps. It's usually the result of hard work in high temperatures during which the individual drinks plenty of water but fails to replace salt. General weakness, giddiness, and muscle cramps are particularly common in this condition and represent the differences between this type of heat exhaustion and water depletion. Prevent with adequate salt and fluid intake. Unacclimated individuals may require as much as 15 to 25g of salt per day for the first 10 days and less thereafter. The extra salt should only be taken if there is adequate water intake! Don't use salt tablets as they tend to remain undissolved in the stomach and pass through the intestines without being fully absorbed.

Thermo-Regulation Failure

Heatstroke is a very serious condition caused by thermoregulatory mechanism failure. In most cases, it's characterized by sudden onset of delirium and coma, very high body temperature (above 105 degrees F), and absence of sweating. This condition is fatal without treatment, so some means of effectively cooling the body must begin as soon as possible. The patient should be seen by a physician immediately but, in case of a delay, the unconscious person should be placed in a well-ventilated area and sprayed with cold water to promote cooling by evaporation and convection in order to quickly lower body core temperature below 102 degrees F (cooling below this temperature should prevent shock). Since most of us don't carry thermometers in our ditty bags, the best bet is prevention.

HEAT ACCLIMATIZATION

Heat acclimatization is a process of adaption, progressively reducing the physiological strain. After about three weeks in a new, hot environment, the body becomes acclimated by means of changes in the temperature regulating mechanism. The rate and degree of acclimatization depend upon the severity of environmental conditions and workload. In the first place, the normal sweat response becomes more efficient, allowing better evaporative body cooling. Secondly, there are changes in blood circulation, increasing the total amount of circulating blood. This means the greater amount of blood in the skin required to increase heat loss doesn't interfere with the blood supply necessary for normal bodily functions.

CONCLUSION

Ultimately, the question of protection from heat, whether on the ground or in the air, comes back to the individual crewmember. We can do much by having a thorough knowledge of the problem, making full use of protective devices provided, planning carefully, and using sound judgment. Thermal stress is a common aeromedical problem. Ensure adequate water and salt intake. Know and routinely use your prevention measures.

Adapted from: Aeromedical Handbook for Aircrew
by T. G. Dobie

DEHYDRATION

While sweating is our most common reaction to the "unaccustomed to" heat, its formation is totally dependent upon fluid availability in the body. With over 60 percent of our body weight in water, we most commonly maintain the balance by simply drinking and eating, then passing the excess through the kidneys.

Balance is the key factor. Think of your body as a bucket with 40 percent of its capacity filled with sand and the remainder water. As the bucket stands in normal atmosphere, water will evaporate at a rate totally dependent upon temperature, and whether or not the pail is in direct sunlight. Your goal is to keep the bucket full. Each time the level drops, add more water—once or twice a day maintains the bucket's proper level without difficulty.

Now, imagine the emergence of many pin holes along its side. Keeping the quantity at the right level now becomes more of a chore because if the bucket runs low, it gets sick; if it goes dry, it dies!

The fact is, whenever environmental temperature exceeds about 91 degrees F, the only method of maintaining body temperature is through sweating. At that rate, your body needs an additional gallon of water per day. That's just to exist; add any exercise and even four extra quarts isn't enough. Furthermore, as in the bucket example, you can't just add it all at once. Waiting till day's end may do you in. You've got to feed the body in increments throughout the entire day. If this don't beat all, decreased atmospheric pressure at altitude increases evaporation, further compounding the problem.

Cool water, iced or not, is best. Tea and coffee are diuretics, as are most sodas. They actually draw more water from the body than they put in. Alcohol is also a diuretic, and its other effects aren't too suitable for flight crews either.

So, don't wait to be thirsty; by then you're already dehydrated!

We're looking for a few good pens.

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Engine Inlet Pulling Force

It'll win every time.

by F.I. Asaki, & D.L. Adamson

An airline operator recently reported an employee ventured too close to the inlet of a running, wing-mounted jet engine. The engine's suction force pulled him toward the inlet. His hat and headphones were ingested but he was able to save himself by hooking his elbow around the nose cowl lip. This near tragedy reminds us that the suction force of a jet engine continues to be a potential danger to anyone working around jet aircraft. This incident cost the airline over $100,000.00 exclusive of aircraft downtime, man-hours, and spare activation costs. The incident reminds us complacency can be very expensive.

Ground crewman aren't the only people on the flightline who need to be aware of this hazard. Flight crewmembers, in their haste to launch the mission, can fall prey to the same hazard and should understand the physics of the problem. Anyone working around aircraft should be aware of the pulling forces (suction) surrounding an engine inlet and the insidious way these forces operate.

Figure 1 illustrates the pulling force near the inlet of a wing-mounted jet engine operating at takeoff thrust. Although the pulling force is shown for a DC-10 engine, a force of this magnitude is typical of most wing-mounted jet engines. The pulling force felt over the body is the same force felt in strong wind, except a 25-mph wind exerts a force of only 20 lbs on an average person. By comparison, an engine operating at takeoff thrust exerts a 1,000-lb force on a person standing within one step of the inlet. Even with the engine at idle, suction is greater than 300 pounds. With nothing to hold onto, a person can offer only about 95 lbs resistance by skidding on the bottom of his shoes. This means suction generated by an engine just at idle is enough to pull almost any-

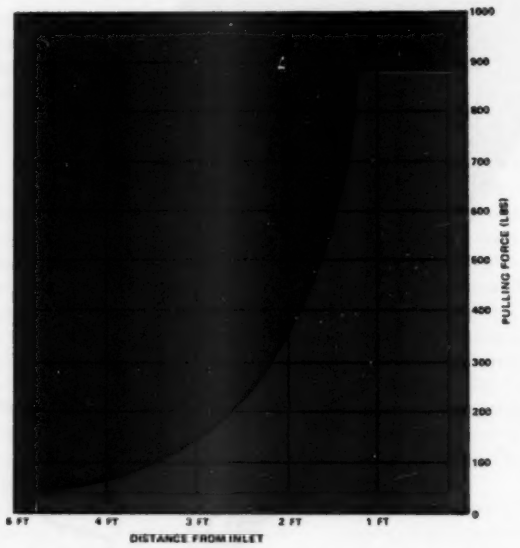

Figure 1. Pulling force (suction) surrounding the inlet of a DC-10 engine operating at takeoff power.

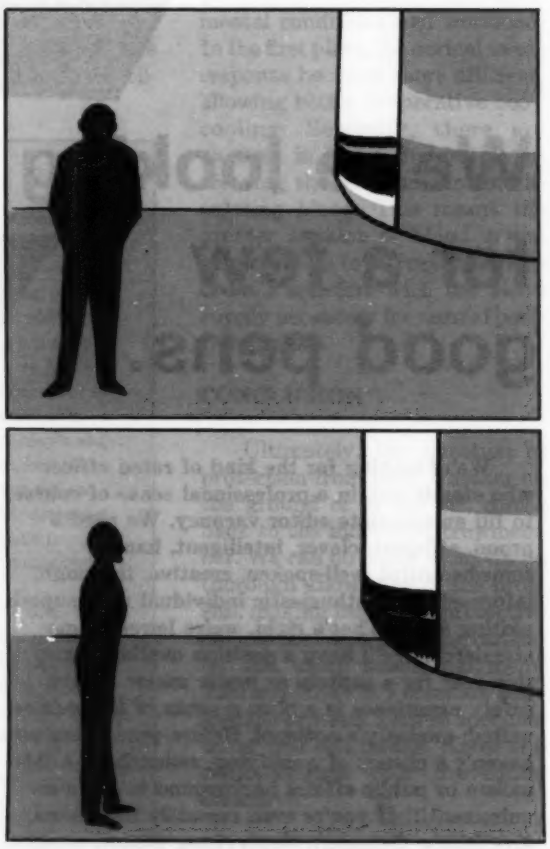

Figure 2. A 90° turn from the position shown above could double the force.

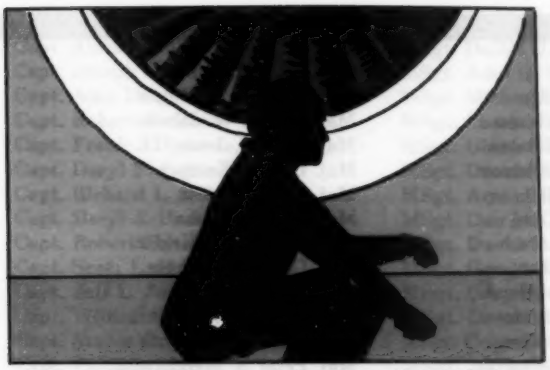

Figure 3. Standing from a crouched position could triple the force.

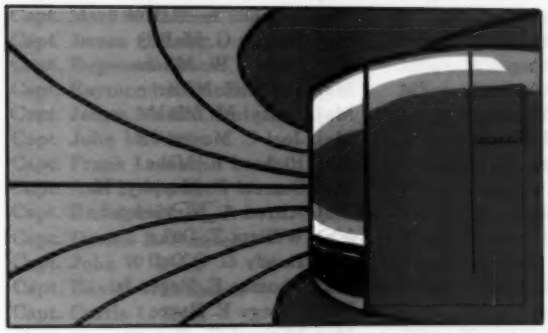

Figure 4. Airflow is especially strong near the lower lip of the inlet.

one into the spinning compressor and is certainly enough to pull in loose articles of clothing, rags, and objects from pockets.

Figure 1 also helps illustrate the suction force's deceptive nature. Jet engine suction operates exactly the same way as suction generated by a vacuum cleaner. Pulling force increases rapidly as the object gets closer to the inlet. This fact often fosters a false sense of security. You'll notice very little suction around the low-velocity area directly surrounding the inlet duct until the substantial force grabs the body. Then, suction more than doubles with each half-step closer to the inlet. Also, merely turning the body 90 degrees from profile could double the force (see Figure 2), and standing up from a crouched position could triple the effect (see Figure 3).

Not only do pulling forces increase rapidly as the object moves toward the inlet, but airflow directions change rapidly around it (see Figure 4). A body passing through the different airflows is subjected to a twisting effect that could cause tumbling and loss of balance. The effect is especially strong near the inlet's lower lip.

The danger area around the inlet is much larger than the high inlet pulling forces region shown in Figure 1. Natural winds and uneven forces from sudden gusts increase the potential danger area. Buildings and fences often create strong, highly localized wind forces. The aircraft fuselage and wings themselves can help create unpredictable wind shears that might add to the inlet-induced flow field.

So, add an additional safety margin when moving around running engines to allow for the possibility of tripping or stumbling toward the inlet or momentary inattention while working. Don't relax just because the engine is running at idle or is relatively small. Although there is less airflow into a small engine, the suction force is just as powerful as that produced by larger engines. Remember, even though high thrust operations aren't common on parking ramps or near terminals, the throttles could be advanced without warning.

Keep a mental picture of danger areas while working or walking around any aircraft. Figure 5 illustrates DC-10 (and KC-10) engine restricted areas that must be kept clear of people, equipment, and foreign material whenever engines are operating. Obviously, the same rules apply for MAC's large and small airplanes. There are no maintenance or operational procedures which require people to be in this area during engine operation. (Note that the restricted area extends *aft* of the inlet opening *as well as* in front.

Wind-blown caps or loose articles from pockets pose a particularly common hazard— attempting to recover the article to avoid engine damage may well result in inadvertently stepping too close to the inlet. Avoid this problem by not wearing loose fitting clothes. Make sure gloves, scarves, and caps are secure.

Don't get sucked in! ✯

Courtesy: *Douglas Service News*

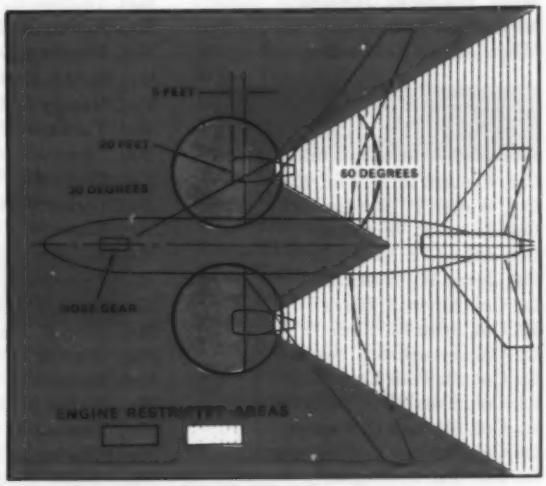

Figure 5. Engine ingestion and blast restricted areas.

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Ranks and units are those at time of award submission. See MACR 900-3 for details on how to apply for your own milestone award.

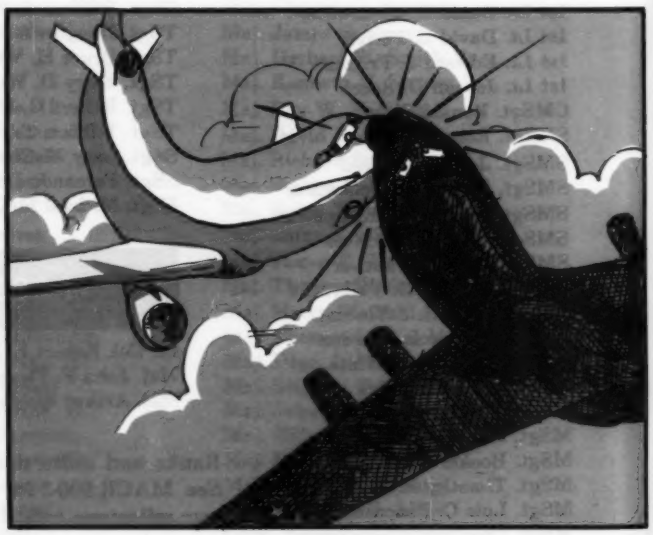
QUICKSTOPPERS

PREMATURE EVACUATION

Entering the darkened Starlifter cockpit, the replacement IP put his checklist on the console forward of the throttles and commenced building his nest in the right seat. The departing left seat IP noticed the number 4 engine fire warning light illuminated, so he initiated "Fire On The Ground" procedures. After selecting "emergency brakes" and discharging the fire bottle, the warning light remained illuminated. The deplaned scanner wasn't consulted, but the right seat pilot was now on headset and declared an emergency with the customary request for fire truck response. After discharging the alternate bottle, the pilots noticed the checklist ignominiously resting against number 4 fire warning test switch. Needless to say, the second half of the local sortie was cancelled for cleanup details . . . .

BIG SKY THEORY ? ? ?

Let's face it, there are only so many destinations, so many feeder fixes, it's a finite number! ! ! So it stands to reason, that on occasion, two airplanes may want to occupy the same space at the same time. This happened quite recently to an L1011–fortunately the crew perked their ears and prevented the near disaster. The L1011 and a C-5 were in a Mediterranean capital's airspace en route to the same intersection. Both had given ETAs within two minutes of each other, and were flying at the same altitude! The L1011 had been handed off to the controller working airspace over the fix. The plot thickened as one controller passed an ETA to the receiving controller that was in error by some 5 minutes. On hearing this, the L1011 pilot immediately requested climb to avoid the Galaxy (forget his fuel savings bonus; he put flight safety first). The two arrived at the same point within 1 minute of each other, however, with visual contact and altitude separation.



F-16 NOT ONLY 'FLY-BY-WIRE' PLANE

During climbout on a local training flight, the H-3 (Jolly Green) pilot attempted to level at assigned altitude. Without pilot input, the collective moved almost two inches upward—as did the helicopter. While this was happening, the master caution light illuminated but no corresponding panel light came on with it. However, number 1 engine fuel flow indicator started fluctuating. The instructor instinctively decided to have no part of this malady and put his green giant on the ground. As luck would have it, the problem couldn't be duplicated. After extensive troubleshooting (to no avail) the helo was cleared to fly again. During its next flight, the helicopter was executing a turning rejoin after takeoff when the collective jumped again, moving the helicopter with it. Major difference this time was the master caution panel lit up like a Christmas tree. Boost pump lights, number 1 generator, number 2 transformer/rectifier, and other caution lights indicated all was not well yet. Another wise decision to land, and this time the helo cooperated with maintainers by displaying warning lights. Maintenance investigation revealed the number 1 generator was producing erratic voltage which the supervisory panel couldn't control. Those silly little electrons had invaded the Automatic Flight Control System causing uncommanded flight control inputs. Who needs it?

LANDING SHORT

Following a 4-hour pro sortie, the MAC C-130 crew was executing an ILS approach in IMC to home station and final landing. During descent, a rather important DC bus light began to flicker. After passing the final approach fix, the crew initiated descent. They broke out of the weather at about 400 ft AGL. At the aircraft's lowest point, the radar altimeter indicated less than 200 ft when almost 3 miles from the threshold. They climbed slightly and made an uneventful landing out of this potential tragedy. Amazingly enough, both pilots' instruments indicated "on course/on glide path" through it all. The VOR/ILS receiver was the culprit and was replaced. Just another day in the life of a MAC aircrew? Not really. It could have been this crew's last day on earth, and you'd better take this story seriously! None of us have the right to second-guess this crew—we've all been there. But although it happened a while ago, let this story be a reminder. Be sensitive to subtle clues of impending disaster like that flickering light. Study those approach plates, be familiar with appropriate rates of descent, the power setting you ought to be carrying, and back up your choices.

OH, WE BRING YOUR TYPE OF AIRPLANE IN HERE ALL THE TIME!

That's what the C-5 aircraft commander was told by the marshalling crew when he arrived at the Navy base. After having the scanner ask the marshaller where he planned to park him, he followed the marshaller's directions and began to taxi. But, when the AC felt he was close enough to a particular row of aircraft, he initiated his own turn. This really teed off the marshaller. After some judicious jockeying, the pilot parked his flying hangar where the marshallers wanted. However, it was obvious the marshallers were annoyed, as they quickly disappeared. The concerned AC hunted them down to find out 'just what was the problem?' The head marshaller politely informed the Galaxy pilot that their ramp is marked with a perfectly measured turn point especially for C-5s. Furthermore, had he just been patient, the plane would have been marshalled to the point and wouldn't have hit anything! The pilot asked to see the spot. Something didn't look right, so he measured the distance to the first helicopter in the row. Sure as shootin', the wing tip would've scored on the whirly's main rotor. But the marshaller wasn't at all impressed. He told the pilot that (1), helos aren't normally parked there; and (2), the owner had already been asked to move it!!! Huh?

Courtesy of Major Mike Bell, 436 MAW/SEF

HARD HAT AREA

If you thought operating either of our theater mini-airliners would be a piece of cake, guess again! You not only flightplan, preflight, and fly; but you also sell tickets, load, and unload. That ain't always so easy. One of our commuter compadres was pulling the cargo net off a load when a wheel chock bounced off his head. FIVE stitches, all the king's horses, and all the king's men pulled it all together again, but the hit cost him a 2.5-hour delay. Boy, talk about adding insult to injury.

After Deadlines

***TMF* ART DIRECTOR TAKES ANOTHER AWARD** — Mr. Tommy O'Laughlin, *TMF*'s very own Art Director, won another graphics award, taking first place in the illustrations category for first quarter FY 88 with his classy Galaxy painting adorning our Dec '87 issue. Readers continue to enjoy Tommy's exceptional illustrations, especially in the Quickstoppers department. He's a very talented artist, and we're lucky to have him on our staff.

TECHNOLOGY TAKES A DIP—Aeronautical Systems Division's Life Support System Program Office at Wright-Patterson AFB, Ohio, is working on a new life preserver that automatically inflates when it contacts water. The life preserver is part of a three-component system designed to prevent drowning when someone ejects from an aircraft overwater. The other parts include an automatic release for the parachute and oxygen mask. Granted, airlifters will have limited use of this 'ejection seat' improvement, but it is interesting!

A NORTON C-141 CREW successfully dropped a 21-ton pallet from their Starlifter recently. The sled-type pallet measured over 87 ft long and was built by the Army Materiel and Test Command at Edwards AFB, California. It took two 28-foot pilot chutes and eight 100-foot main chutes to float it safely to earth. The test was designed to approximate outsized loads and will enhance capabilities of rapid-deployment combat forces.

LIGHTS OUT AIR REFUELING APPROVED —HQ MAC/DO has authorized helicopter NVG air refueling for both 1 SOW and 41 RWRW H-53 aircrews. Further testing has been requested to extend validation of lights out aerial refueling to MH-60s.

FLYERS FORUM and FLYERS ANONYMOUS are *TMF* features designed to give MAC crewmembers a chance to express their opinions. Forum items are bylined, Flyers Anon are not—not even when passed upstairs for review! But you may not recall seeing either for a while. Reason's simple—you haven't sent us any! We encourage and welcome this form of 'self expression.' Mail it 'pouch' through your squadron admin to: HQ MAC/IGFE, Scott AFB, IL 62225-5101.

Touch 'n Go

"It'll be close sir, but I think we'll make it."

"Okay, scanner, disregard clearance to deplane . . ."